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Major Charles Howell
Air Force Center for
Environmental Excellence
Brooks Air Force Base, TX 78235-5000

Subject: AFCEE Environmental Assessment of the Zokniuk Aerodrome,
Siauliai, Lithuania, 15-26 September 1993

Reference: Log No. 93-05083

Dear Major Howell:

Enclosed is the above-referenced trip report.

If you have any questions, please contact Mr. James Morgan at 536-4319
or me at 536-4343.

Sincerely,

Fred T. Price

Fred T. Price, Ph.D.
Group Leader
Toxic and Hazardous Materials
Assessment and Control

FTP/JHM/chp

Enclosure

cc: Lt. Col. Jay Carson
Lt. Col. Darrel Cornell
Lt. Col. Ross Miller
Lt. Col. Charles Scott
Capt. Mitch Hicks
Mr. Leo Vasaitis

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5 January 1994

Subject: AFCEE Environmental Assessment of the Zokniuk Aerodrome, Siauliai,
Lithuania, 15-26 September 1993

The purpose of this letter is to report AFCEE's actions in support of the U.S. European Commands Military-to-Military Contact Program (MMCP) visit to the Zokniuk Aerodrome at Siauliai, Lithuania. The objective of the program is to promote peace, stability, and democracy through nondefense-related, military-to-military personnel contact. The MMCP achieves its mission by deploying military contact teams (MCTs) to assist in developing designated military forces into positive and constructive elements of society during their transition to democracy and free market economies.

1. Objective and Organization

The Zokniuk Aerodrome MCT members were Lt. Col. Charles Scott (mission leader and civil engineer), Lt. Col. Jay Carson (MMCP liaison leader and civil engineer), Lt. Col. Ross Miller (environmental engineer), Capt. Mitch Hicks (radiation engineer), Mr. Leo Vasaitis (civil engineer), and Mr. James Morgan (environmental engineer and hydrologist). Affiliate organizations, addresses, and telephone numbers for the Zokniuk project MCT members are included with the executive summary of the MCT daily report (enclosure 1). The focus of the MCT visit to the Zokniuk Aerodrome was to promote and exhibit U.S. interests and mechanisms in order to:

- Support a civilian-controlled military.
- Provide education and training concerning U.S. military environmental responsibilities.
- Identify for the Lithuanian Military representatives the U.S. military methods for environmental resource management to maintain and enhance the quality of life.
- Conduct environmental humanitarian assistance of an empowering nature.

Specific MCT mission objectives in support of the preceding goals were to assess and provide recommendations concerning the following:

- Management of the base closure process and transition of aerodrome assets to the Siauliai economy.
- General environmental conditions of the aerodrome.
- Identification of the conceptual site model components requiring further environmental investigation or "early" remedial action.
- Characterization of the MCT's perception of environmental risk at the facility.

2. Background and Approach

The Zokniuk Aerodrome was established by the German armed forces in 1915. After World War I, the facility operated as both a public and military airfield until the second German invasion in 1941. During World War II, a hard surface runway was constructed, and the facility became a forward Luftwaffe air base on the eastern front. The airfield was captured by the Russian Army in 1944 and was continually improved and operated as a Soviet military aerodrome and logistics center until 1993. Near that time, former Soviet forces withdrew from the newly reorganized Republic of Lithuania. It is believed that the aerodrome was operated using the usual European waste management practices at an air field typical of the time periods until facility closure approached. Final closure of the Zokniuk Aerodrome by former Soviet forces occurred shortly after July 1993. Information believed reliable by the MCT indicated that serious source releases occurred just prior to and after facility closure. Two principal types of source releases were reported: fuel spills and leaks, and radioactive waste disposal. Other information speculated that significant heavy metals contamination also occurred around the time of base closure. In order to better understand the scope of the actual environmental problems and develop a plan for managing these problems, the MCT organized itself into three teams. Each team consisted of two technical professionals and focused on specific problem areas. The first team focused on radiation problems, the second team focused on fuel problems, and the third team compiled information and questioned former air field workers in order to identify or characterize unknown or suspected environmental problem areas.

3. Observations

The MCT members visited the Zokniuk Aerodrome on 21-23 September. Observations made by the MCT are addressed by mission objective as follows:

Management/Transition of Zokniuk Base Closure Process

The closure process that occurred at the Zokniuk Aerodrome differs dramatically from the process that occurs in the United States. Some principal differences are the following:

- The aerodrome was not well maintained during its final period of operation (e.g., tank and pipeline leaks and weather damage to structures).
- Security of the facility was inadequate at the time control was transferred to Lithuania.

The MCT observed many instances of malicious destruction of resources at the Zokniuk Aerodrome due to inadequate security. Some of the vandalism may have occurred as forces departed, but many problems (e.g., theft of electrical wire) appeared to occur after closure. Civilian trespassers were observed on the base by the MCT. Lithuanian officials reported that much of the damage to buildings and utilities was done by trespassers. It is not known how much vandalism was done by the departing former Soviet forces. The following are typical examples of the vandalism:

- Most electrical control panels and motors have been removed.
- Miles of electrical cable and telephone wiring have been ripped from the ground and salvaged for copper.
- Goods left in warehouses by the departing military have been destroyed or stolen.
- Most utility and light fixtures have been removed from many of the buildings.
- Some buildings appear to have been dynamited.

An additional problem affecting reutilization of the aerodrome assets is that a clear development objective has not yet been established by the local authorities. Local officials hope that the facility will become a regional airport or a commercial airplane repair facility; however, no specific plan for attaining these objectives or for preserving the labor and technical base that attracts and supports these types of objectives has been developed. Also, a lack of individual entrepreneurial spirit has resulted in an outward search for development assistance as opposed to local economic development of the aerodrome.

General Environmental Condition of the Zokniuk Aerodrome

The environmental condition of the Zokniuk Aerodrome is poor by U.S. standards. However, when the condition of the environment is measured by relative risk or by long-term environmental damage, the environmental condition of the aerodrome may be very good. The environmental findings of the MCT are organized below by contaminant type:

- **Radiation Problems**—MCT members found one small area of radioactive contamination. Using intrusive measurement techniques, adjacent to a location of radioactive soil removal performed by the Soviets, as noted on the MCT's Zokniuk Aerodrome investigation sketch (enclosure 2). This area of radiation contamination was identified by excavating a shallow (30–45 cm) test pit adjacent to the area of soil removal by the Soviets and collecting radiation measurements. The measured amount of radiation was 1.5 mR/hr. This level of radiation is slightly below the allowable continual lifetime exposure level permitted in the United States. The source of the contamination is believed to be soil contaminated with radium dial paint waste. The identified area of contamination was covered with tree roots that probably deterred excavation of the area when the adjoining soil contamination was removed. Surface radiation surveys were also conducted at the nuclear weapons staging area, fighter aircraft hangars, other suspected radium burial sites, a suspected strontium-contaminated site, and a suspected barium-contaminated site, but no level of radiation exceeding U.S. standards was found resultant from surface radiation measurements.
- **Fuel Problems**—Large areas of the aerodrome are contaminated with jet fuel or kerosene. All of the fuel-contaminated areas found by the MCT were located east of the main runway, usually near one of two large tank farms or near a known fuel distribution pipeline that ran parallel to the flight line. Strong, kerosene odors and heavy fuel stains from releases at the surface were identified. However, visual observations and scientific evidence in current technical literature indicate that long-term damage to surface soils and unsaturated soils in the vadose zone will be negligible due to the natural biologic attenuation of fuel contaminants of this type.

An open storm water canal parallel to the northeastern flight line was noted during the visit to have heavy rainbows. Flow in the canal is estimated to be about 3 cubic feet per second. Samples of surface water in the canal were collected at three points (locations 7a, 7b, and 8), and field tests for dissolved oxygen and pH were performed by the MCT. Test results indicated that sufficient oxygen is available during low-flow conditions to stabilize the organic load during dry-flow conditions. However, excessive organic loads

may occur during storm-flow conditions due to resuspension of volatile sediments in the canal bed.

In addition to the surface fuel problems, major contamination of the shallow groundwater aquifer was also reported to the MCT. A short investigation of these claims was conducted by the MCT. Five monitor wells had been constructed previously at the aerodrome. Each of the wells was measured, sampled, bailed, and monitored for recovery of fuel and groundwater in order to conduct a simple apparent versus actual free-floating product study of the groundwater. Field observations and measurement results determined by the study are noted in enclosure 2. Only two of the five monitor wells (locations 1 and 2) were found to contain a free-floating product that appeared to be weathered jet fuel. After these well locations were bailed and allowed to recover, it was determined that the actual free-floating product thickness on the groundwater at these locations was insufficient to justify installation of any fuel recovery system other than hand bailers. Samples of groundwater from the three monitor wells suspected of the highest contamination potential (locations 1, 2, and 4) were collected by the MCT and analyzed for soluble oil and grease by the Lithuanian Environmental Directorates District Laboratory. Sample results ranged from an oil and grease concentration of 8.0 to 12.8 mg/L. Concentrations of oil and grease at these levels are expected to attenuate naturally over an acceptable time period. Atmospheric headspace measurements of total hydrocarbons, oxygen, and carbon dioxide for all five monitor wells indicate that biological degradation is occurring. Based on the scientific information obtained from the monitor wells, there is no present technical basis for claiming that 50,000 cubic meters of soil or broad expanses of the aerodrome's groundwater is contaminated by floating fuel. However, two significant points of free-floating product contamination were identified. One point was about 500 meters east of location 1, and the second point was about 650 meters south of location 2. "Fuel product mining operations" were being conducted by civilians at both points. These operations consisted of hand-dug, open-pit mines where fuel was skimmed by hand as it accumulated under "spring" simulated conditions. "Fuel mining" operations were reported to currently recover about 50 to 200 liters of fuel per day. Prior to aerodrome closure, the "fuel mine" south of location 2 was reported to recover as much as 2 metric tons of product per day. The source of both of these fuel contamination points is speculated to be probable fuel pipeline leaks; however, sufficient scientific information is not available to characterize either the source or the extent of contamination associated with these points of product recovery.

During their visit the MCT identified one previously unknown fuel source. While searching for the monitor well near location 4, two vertical, 3-inch diameter, stainless steel manifold headers to a pipeline were found. The pipeline contained an undetermined volume of clear product resembling kerosene. The two pipeline headers are identified in enclosure 2 as location 3.

In addition to the previously noted fuel contamination problems, a safety problem may exist at the former rocket fuel tank farm. It was reported to the MCT that tanks at the site still contain residual product. Storage vessels at the rocket fuel tank farm appear to be organized into two separate types of product storage. The MCT believes one type of product storage tank may contain residuals of propellant (e.g., hydrazine), and the other type of product storage tank may contain residuals of an oxidizer (e.g., nitrogen tetroxide). Personal exposure to propellants and oxidizers of these types may be lethal. Combining a propellant and an oxidizer will result in an explosive reaction. The Lithuanian Military patrols the rocket fuel tank farm with armed guards to prevent trespassers from vandalizing the rocket fuel storage area.

- **Heavy Metals Problems**—The MCT was not prepared to sample or investigate potential contamination resulting from heavy metals during their visit to the Zokniuk Aerodrome. However, two Russian mothers residing near the base sought out the MCT and stated that their children were ill due to heavy metals contamination at the aerodrome. They presented medical records that showed elevated levels of copper, lead, and zinc in their children's blood. Both mothers claimed that the children had symptoms of hair loss, lethargy, and retardation. The MCT had no means to investigate these claims, but they have made recommendations for further studies concerning the possibility of heavy metals contamination and also offered to provide risk assessment consultation to the Lithuanian Military, provided heavy metals sample data are sent to the MCT through the U.S. European Commands MMCP. The MCT also observed numerous sites where electrical cable and wire insulation had been burned for copper recovery. Crude metal salvage operations such as this can result in significant contamination from heavy metals both to the operators and the environment.

Conceptual Site Model Components Requiring Investigation and Early Action

The most significant problem that impeded the MCT mission was the lack of sufficient technical information of a known quality to characterize the contaminant sources, pathways, and receptors at the Zokniuk Aerodrome. Additional technical information that is needed is described below:

- Further investigation of all potential contaminant migration pathways (e.g., air, soil, surface water, and groundwater) is needed in order to characterize the real human health and ecological risks posed at the Zokniuk Aerodrome.
- Additional information is especially needed concerning background and potential exposure concentrations for heavy metals contamination. Investigation of the water supply, water distribution pipes, and wall paint at the residences of individuals suspected to have been exposed to heavy metals could assist in early identification of heavy metals exposure points.
- Much more information is needed to identify the point source and extent of fuels contamination in groundwater and to focus any required remediation efforts.
- Any sites of potential radiation exposure identified in the future will also require investigation.

Two early action remedial activities are supported and recommended by the MCT. Sufficient technical information has been developed to warrant the following:

- Continued operation and improvement of the two "fuel mining operations" near locations 1 and 2 in order to reduce the mass of contaminant in the groundwater pathway at that point.
- Construction of fencing, warning signs, and a small, steel-reinforced 8-inch thick concrete cap over the identified radioactive area for the purpose of interrupting the potential exposure pathway to radioactive contaminants.

Perception of Overall Environmental Risk

The contamination of the environment at the Zokniuk Aerodrome from fuels, radioactive materials, and heavy metals would be unacceptable to the regulatory institutions and a concerned public in the United States. It was the opinion of the MCT that the perceived risks posed at the Zokniuk Aerodrome are also unacceptable to the Lithuanian public. The real risk posed from contamination at the aerodrome may hypothetically exceed an additional cancer death per 100,000 population. However, due to the limited financial resources for characterizing and correcting either perceived or actual environmental risks within Lithuania, the Zokniuk Aerodrome should be examined in relation to other Lithuanian environmental and health risk exposure scenarios. Other

exposure scenarios with much greater human health and ecological risks probably exist in Lithuania. Some possible instances include the following:

- A great deal of concern exists about the potential for an accident at the Ignalina, Lithuania, nuclear power plant (modeled after and four times larger than the Chernobyl nuclear power plant).
- At the time of the MCT's visit to Siauliai, U.S. health authorities reported that a cholera epidemic was occurring.

Risk of death from a nuclear power plant catastrophe or communicable disease is perceived by the MCT to be far greater than the human health and ecological risk posed at the Zokniuk Aerodrome. Consequently, it is imperative that all recommendations requiring expenditure of Lithuanian financial resources be prioritized to derive maximum value for its citizens.

4. Recommendations

As a follow-on to successful completion of the Zokniuk Aerodrome MCT mission, the following recommendations are made to promote the diplomatic objectives of the MMCP with respect to the Lithuanian Military:

- Arrange for Lithuanian personnel to attend base closure plan orientation. Formal orientation concerning U.S. base closure policies would enable the Lithuanian Military to better organize their facility closure resources so that they support local free market economic objectives.
- Arrange for Lithuanian technical personnel to attend AFCEE's training on field quality assurance, laboratory audits, remedial technology transfer, risk assessment, etc.
- Transfer military surplus related to environmental engineering and environmental investigation to the Lithuanian Military in order to enable them to characterize and mitigate military environmental problems. Examples of useful equipment of this type are small centrifugal and air jet pumps, tractor pumps, portable tanks, field test kits, small power augers or drills, monitor well completion materials, oil boom, safety equipment, etc.
- Send an AFCEE field team to demonstrate U.S. military environmental investigation and remediation techniques to Lithuanian Military and technical personnel.

- Assist the Lithuanian Military with advice concerning environmental project valuation and contracting for environmental services.
- Establish a telephone technical contact assistance program accessible to the Lithuanian Military.
- Establish a foreign military officer exchange program for foreign environmental professionals. As an example, a junior Lithuanian Military officer might visit and work as a support person with an AFCEE Team Chief.

The preceding information summarizes the findings and recommendations of AFCEE's support to the MMCP for the Zokniuk Aerodrome project.

If you have any questions, please contact Lt. Col. Charles Scott at (210) 536-5205.

Sincerely,

Charles W. Scott, Lt. Col., USAF
Chief, Base Closure Restoration Division

Ross N. Miller, Lt. Col., USAF, BSC
Chief, Technology Transfer Division

Fred T. Price
for James H. Morgan
Lead Engineer, The MITRE Corporation

Enclosures (2)